REMARKS

I. FORM PTO 892 – Second Request for Corrected Form (Missing Reference)

The body of the Office Action dated November 25, 2008 cites in paragraph 11, Kai-Kit Wong, A Joint-Channel Diagonalization for Multiuser MIMO Antenna Systems, IEEE Trans. on Wireless Comm., Vol. 2, No. 4 (July 2003). But, this reference is not listed on the Examiner's Form PTO 892 as being considered.

Applicants respectfully request a corrected, updated Form PTO 892 listing this reference.

II. REQUEST FOR TELEPHONE INTERVIEW

Should the Examiner find that the above-amendments and/or following remarks do not overcome the remaining rejections, Applicant's attorney requests a telephone interview to further discuss the rejection.

III. CLAIM REJECTIONS UNDER §102(b)

Claims 1-6 and 9-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Hottinen et al., U.S. Patent No. 7,436,896 B2.

A. Hottinen U.S. 7,436,896

Hottinen relates to methods and systems for achieving joint high data transmission and diversity in both space and time/frequency in a telecommunication system.

The described method comprises the steps of:

- converting a stream of complex symbols to at least two at least partially different streams of complex symbols;
- modulating the at least two streams of complex symbols to form at least two code matrices (C1, C2);
- transforming said code matrices using linear transformations (U), to construct at least two transformed transmit diversity code matrices (X1, X2);
- constructing a transmission code matrix (C) using at least two transmit diversity code matrices;

- transmitting said transmission code matrix using at least three different transmit antennas paths.

The Applicant does not share the Examiner's opinion concerning the document Hottinen.

B. **Example of Applicant's Claim 1**

First of all, the Applicant would like to recall that according to the invention of claim 1, a vector X, sized *N*, is divided into *Nt* sub-vectors.

For example, we consider an X vector sized $N=10$, such as $X=(x_0,x_1,x_2,x_3,x_4,x_5,x_6,x_7,x_8,x_9)$, which is divided into $Nt=2$ sub-vectors $X1=(x_0,x_1,x_2,x_3,x_4)$ and $X2=(x_5,x_6,x_7,x_8,x_9)$.

Each of the *Nt* sub-vectors is then multiplied by a distinct sub-matrix sized $(N/Nt,N)$, each sub-matrix being associated with a distinct transmit antenna, and the sub-matrices being obtained by subdivision of a unitary square matrix.

Considering again the previous example, if the unitary square matrix sized $(N,N)=(10,10)$ is such as:

$$A=\begin{pmatrix} a_0 & a_1 & \cdots & a_9 \\ a_{10} & a_{11} & \cdots & a_{19} \\ \vdots & \vdots & \ddots & \vdots \\ a_{90} & a_{91} & \cdots & a_{99} \end{pmatrix},$$

we obtain according to claim 1 two sub-matrices sized $(N/Nt,N)=(5,10)$, named *A1* (sub-matrix associated with the first transmit antenna) and *A2* (sub-matrix associated with the second transmit antenna), such as:

$$A1=\begin{pmatrix} a_0 & a_1 & \cdots & a_9 \\ a_{10} & a_{11} & \cdots & a_{19} \\ \vdots & \vdots & \ddots & \vdots \\ a_{40} & a_{41} & \cdots & a_{49} \end{pmatrix} \text{ and } A2=\begin{pmatrix} a_{50} & a_{51} & \cdots & a_{59} \\ a_{60} & a_{61} & \cdots & a_{69} \\ \vdots & \vdots & \ddots & \vdots \\ a_{90} & a_{91} & \cdots & a_{99} \end{pmatrix}.$$

We thus obtain a first sub-vector *X1'* resulting form the multiplication of *X1* by *A1* and a second sub-vector *X2'* resulting from the multiplication of *X2* by *A2*, such as:

$$X1' = \left(\left(x_0 a_0 + x_1 a_{10} + ... + x_4 a_{40}\right) \quad \left(x_0 a_1 + x_1 a_{11} + ... + x_4 a_{41}\right) \quad ... \quad \left(x_0 a_9 + x_1 a_{19} + ... + x_4 a_{49}\right) \right)$$

$$X2' = \left(\left(x_5 a_{50} + x_6 a_{60} + ... + x_9 a_{90}\right) \quad \left(x_5 a_{51} + x_6 a_{61} + ... + x_9 a_{91}\right) \quad ... \quad \left(x_5 a_{59} + x_6 a_{69} + ... + x_9 a_{99}\right) \right)$$

The first sub-vector *X1'* can then be sent by the first transmit antenna, and the second sub-vector *X2'* can be sent by the second transmit antenna.

C. **Differences Compared to Hottinen**

Hottinen does not disclose the idea of multiplying each of the *Nt* sub-vectors by a distinct sub-matrix, the distinct sub-matrices being obtained by dividing a unitary square matrix.

Several hypotheses are possible:

i. First of all, one can consider that the orthogonal code matrices C1 and C2 (block 104) correspond to the sub-matrices according to the discussed invention of claim 1. However, according to Hottinen, the codes matrices C1 and C2 are each of <u>arbitrary dimension and rate</u> (column 5, lines 7-8), whereas according to the discussed invention, the size of each of the sub-matrix is defined and equal to $(N/Nt, N)$.

Moreover, the code matrices C1 and C2 according to Hottinen are not obtained by subdividing a square unit matrix.

This hypothesis is therefore not plausible.

ii. One can also consider that the transmission matrix C (block 106) is a unitary square matrix, and the transmit diversity code matrices X1, X2, such as for example $X1 = C1 + C2$ and $X2 = C1 - C2$, are obtained by subdividing said transmission matrix C.

This interpretation is also erroneous, since according to Hottinen, we use the diversity code matrices X1 and X2 to construct the transmission matrix C (see equation 6), as opposed to the contrary.

As a consequence, the diversity code matrices (X1, X2) cannot be obtained by subdividing a unitary square matrix, and this hypothesis is not plausible.

iii. Finally, one can consider that the matrix U (block 105) is a unitary square matrix, and the diversity code matrices (X1, X2) are obtained by subdividing the unitary square matrix U.

According to Hottinen, the matrix U is used to transform the code matrices C1 and C2 in order to construct the transmit diversity code matrices X1 and X2, according to equation (5): $X = UC$. The matrix U is defined by $U = V \otimes I$, where $\otimes$ is the Kronecker product.

As a consequence, the diversity code matrices X1, X2 cannot be obtained directly by subdividing the matrix U, but only <u>after multiplying the matrix U by the matrix C</u>.

Moreover, the use of the Kronecker product according to Hottinen (page 6, lines 1-3) maximizes the number of zero elements on the transformation matrix U. On the contrary, according to the discussed invention of claim 1, the matrix from which are obtained the sub-matrices is full (claim 4), which provides an encoding rate equal to 1.

Finally, it should be recall that each sub-matrix according to an example of claim 1 is associated with one transmit antenna.

According to Hottinen on the contrary (figure 1, block 102, and equation 6), the sub-matrix X1 is associated with the first two transmit antennas, and the sub-matrix X2 is associated with the last two transmit antennas ("*using four transmit antennas*").

Hottinen also mentioned the use of at least three transmit antennas, whereas according to equation (6) of Hottinen, there are only two sub-matrices X1 and X2.

It is thus impossible that each sub-matrix is associated with a distinct transmit antenna, as proposed in the discussed invention of claim 1.

As a consequence, Hottinen is not relevant toward Applicant's claims.

D. **Amendments to Claims 1 and 9 - Request for Entry**

Applicant respectfully requests that the proposed amendments be entered to clarify the existing differences between Applicant's claims and Hottinen. These amendments are believed not to raise significant new issues, as the existing claims themselves are not anticipated by Hottinen.

In order to show more clearly the differences between Hottinen and the discussed invention, claims 1 and 9 have been slightly amended to define the sizes of the unitary

square matrix (sized (N,N)) and of the sub-matrices (sized $(N/Nt,N)$). These features help to define more precisely the subdivision of the square unitary matrix into sub-matrices.

Accordingly, these amendments are believed not to raise new issues but merely clarify the existing differences between Applicant's claims and the cited reference.

IV. CLAIM REJECTIONS UNDER §103(a)

Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hottinen et al., U.S. Patent No. 7,436,896 B2, as applied to claim 1 above, and further in view of Agrawal et al., U.S. Patent No. 6,873,606 B2.

As discussed above, Hottinen fails to anticipate the inventions of independent claims 1 and 9.

A. **Agrawal U.S. 6,873,606**

Agrawal relates to data communication and to a rate adaptive transmission scheme for MIMO communications systems.

Agrawal is not relevant toward the discussed invention, as it does not disclose, nor suggest, the ideas of:

- dividing a unitary square matrix in order to obtain a set of sub-matrices, each sub-matrices being associated with a different transmit antenna,
- multiplying each of the sub-vectors by a distinct sub-matrix, and
- sending the resulting sub-vector using the transmit antenna associated with the corresponding sub-matrix.

As a consequence, Agrawal, taken alone or in combination with Hottinen, is not relevant toward the discussed invention.

V. CONCLUSION

The foregoing remarks are intended to assist the Office in examining the application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered exhaustive of the facets of the invention which are rendered patentable, being only examples of certain advantageous features and

differences, which Applicants' attorney chooses to mention at this time. For the foregoing reasons, Applicants reserve the right to submit additional evidence showing the distinction between Applicants' invention to be unobvious in view of the prior art.

Furthermore, in commenting on the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between the same and the present invention have been mentioned, even though such differences do not appear in all of the claims. It is not intended by mentioning any such unclaimed distinctions to create any implied limitations in the claims.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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